VITA

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Research Interests

Scientific and Parallel Computation, Computer Modeling and Simulation, Application Software Development, Numerical Analysis

Education

Ph.D. Applied Mathematics, 1989, Michigan State University
M.S. Applied Mathematics, 1985, Michigan State University
B.S. Mathematics, 1982, Beijing Normal University

Experience

Consultant, Mathematics and Computer Science Div., Argonne National Laboratory, 9/2004-present.

Research Professor, Dept. of Computer Science, Illinois Institute of Technology, 8/2000 - present.

Sr. Scientific Programmer, Mathematics and Computer Science Div., Argonne National Laboratory, 9/2001-9/2004.

Software developer, Lucent Technologies, 1-8/2001.

Visiting Scientist, Mathematics and Computer Science Div., Argonne National Laboratory, 8/1999-12/2000.

Tenured Associate Professor, Dept. of Mathematics, Louisiana State Univ., 1997-2000;

Tenured Associate Professor, Dept. of Mathematical Sciences, Clemson Univ., 1996-1997.

NSF VPW Visiting Professor, Dept. of Mathematics, Louisiana State Univ., 1/1996-7/1997.

Visiting Scientist, Institute for Computer Applications in Science and Engineering (ICASE), NASA Langley Research Center, 9/1992-8/1994, 7-8/1995, 7-8/1996.

Visiting Assistant Professor, Dept. of Mathematics, Iowa State Univ., 5-8/1991.

Assistant Professor, Dept. of Mathematical Sciences, Clemson Univ., 8/1989-8/1996.

Awards and Acknowledgments

1. 2015 SIAM/ACM Prize in Computational Science and Engineering (joint with S. Balay, J. Brown, W. Gropp, M. Knepley, L. McInnes and B. Smith) as a core developer, in recognition of outstanding contributions to the development and use of mathematical and computational tools and methods for the solution of science and engineering problems.

2. 2009 R&D 100 Award Winner, as a member of PETSc development team.

3. Acknowledgement from the Alpha Lambda Delta Freshman Honor Society for Superior Instruction of Freshman Students, Fall, 1998.

4. Award for Faculty Excellence, Clemson University, 1996.

Software Research and Development

- Portable, Extensible Toolkit for Scientific Computation (PETSc), http://www.mcs.anl.gov/petsc, 1999 - present.
- Framework Application for Core-Edge Transport Simulations (FACETS), https://www.facetsproject.org, 2006 - 2011.

Research Publications

Journal Articles:

1. "PETSc DMNetwork: A Library for Scalable Network PDE-Based Multiphysics Simulations," (S. Abhyankar, G. Betrie, D.A. Maldonado, L.C. Mcinnes, B. Smith, H. Zhang), *ACM Transactions on Mathematical Software(TOMS)*, Accepted.
2. "SIESTA-SIPs: Massively parallel spectrum-slicing eigensolver for an ab initio molecular dynamics package," (M. Keceli, F. Corsetti, C. Campos, J. E. Roman, H. Zhang, A. Vazquez-Mayagoitta, P. Zapol, A.F. Wagner), *Journal of Computational Chemistry*, 2018.
3. "Shift-and-Invert Parallel Spectral Transformation Eigensolver: Massively Parallel Performance for Density-Functional Based Tight-Binding," (M. Keceli, H. Zhang, P. Zapol, D. Dixon, A. Wagner), *Journal of Computational Chemistry*, Volume 37, Issue 4, 2016, pp.448-459, doi 10.1002/jcc.24254.
4. "Analysis and Practical Use of Flexible BiCGStab," (J. Chen, L. C. McInnes, H. Zhang), *Journal of Scientific Computing*, Volume 68, Issue 2, pp. 803-825, 2016, DOI 10.1007/s10915-015-0159-4.
5. "Sparse Matrix-Matrix Products Executed Through Coloring," (M. McCourt, B. Smith, H. Zhang), *SIAM J on Matrix Analysis and Applications*, Vol. 36, Issue 1, 2015, pp.90-109.
6. "Hierarchical and Nested Krylov Methods for Extreme-Scale Computing," (L. C. McInnes, B. Smith, H. Zhang, R. Tran Mills), *Parallel Computing*, num. 40, 2014, pp.17-31.
7. "Improving parallel scalability for edge plasma transport simulations with neutral gas species," (M. McCourt, T. D. Rognlien, L. C. McInnes, H. Zhang), *Computational Science and Discovery*, 2012, vol. 5, num. 014012, doi 10.1088/1749-4699/5/1/014012.
8. "Sparse Triangular Solvers for ILU Revisited: Data Layout Crucial to Better Performance," (B. Smith and H. Zhang), *International Journal of High Performance Computing Applications*, Vol. 25, Num. 4, 2010, pp.386-391
9. "SIPs: Shift-and-Invert Parallel Spectral Transformations," (H. Zhang, B. Smith, M. Sternberg and P. Zapol), *ACM Transactions on Mathematical Software(TOMS)*, Vol. 33, Num. 2, 2007.
10. "Pseudozeros of Multivariate Polynomials," (J. W. Hoffman, J. J. Madden and H. Zhang), *Mathematics of Computation*, Vol. 72, No. 242, 2003, pp.975-1002. DOI: 10.1090/S0025-5718-02-01429-1

Symposium Organization

1. "Advances in Parallel Multiphysics and Multiscale Computing, (H. Zhang and Shrirang G. Abhyankar), SIAM Conference on Parallel Processing for Scientific Computing, March 7-10, 2018, Tokyo, Japan.

2. "Parallel Implicit Approaches in Magnetic Fusion Applications, (L. C. McInnes, T. D. Rognlien and H. Zhang), SIAM Conference on Parallel Processing for Scientific Computing, March 12-14, 2008, Atlanta, Georgia.

3. "Numerical Computation Using Portable, Extensible Toolkit for Scientific Computation (PETSc), (H. Zhang), Zurich, Switzerland, 6th International Congress on Industrial and Applied Mathematics, July 16-20, 2007.

Invited Talks

1. "PETSc: High-Performance Software Library for Engineering and Science Simulation, Applications and Data Management", The 13th CHPC National Conference, Johannesburg, South Africa, Dec 1-5, 2019.

2. "High-Performance Software Library for Engineering and Science Simulation", Workshop on Scientific Computation with Applications, University of Arkansas at Little Rock, Nov. 1-2, 2019.

Courses Taught

- Advanced Scientific Computing
- C++ Plus Data Structure
- Object-Oriented Analysis and Design
- Multivariable Calculus, Calculus, Pre-Calculus, College Algebra and Trigonometry
- Discrete Methods, Finite Mathematics with Application
- Applied Matrix Algebra
- Numerical Analysis, Advanced Scientific Computing, Numerical Linear Algebra

Community Service

Member of Advisory Board, Aspiritech, a non-profit organization in metropolitan Chicago which provides employment opportunities to individuals with Asperger's syndrome, May 2009 - present.